

## 1. Product Overview

The TYZS5 is a low-power embedded Zigbee module developed by Hangzhou Tuya Information Technology Co., Ltd. The module consists of a EFR32MG13P732HG highly integrated wireless RF processor chip and a small number of peripheral devices. It has a built-in 802.15.4 PHY/MAC Zigbee network protocol and a large number of library functions. The TYZS5 embeds a low-power 32-bit ARM Cortex-M4 core, 512KByte Flash program memory, 64KB RAM data memory, and a wealth of peripheral resources.

The TYZS5 is a FreeRTOS platform that gathers all Zigbee MAC and TCP/IP libraries into one place. It enables users to build on the product and develop embedded Zigbee products that suit their individual needs.

### 1.1 Features

A built-in low-power 32-bit ARM Cortex-M4 processor with a DSP instruction set and a floating point unit that doubles as an application processor

Wide operating voltage: 1.8V-3.8V

Peripherals: 6×GPIOs, 1×UART (with flow control),

Zigbee operating characteristics :

- Supports 802.15.4 MAC/PHY
- Operating channels 11to 26@2.405-2.480GHz, air-interface rate 250Kbps
- Built-in DC-DC circuit for maximum power efficiency
- 63uA/MHz operating power consumption; 1.4 uA sleep current
- Active net pairing with terminal devices
- Built-in PCB onboard antenna
- Operating temperature: -40°C to 85°C
- Supports hardware encryption and supports AES 128/256

### 1.2 Primary application fields

- ◇ Smart buildings
- ◇ Smart homes/appliances
- ◇ Smart plugs, smart lighting
- ◇ Industrial wireless control
- ◇ Health and measurements
- ◇ Asset tracking

## 2. Module interfaces

### 2.1 Package dimensions

The TYZS5 has 2 rows of pins with a 2mm gap and a total of 14 external pins.

TYZS5 dimensions: 14.8mm (W) x 20.4mm (L) x 2.0mm (H),TYZS5 dimensions are as shown in Figure 1:

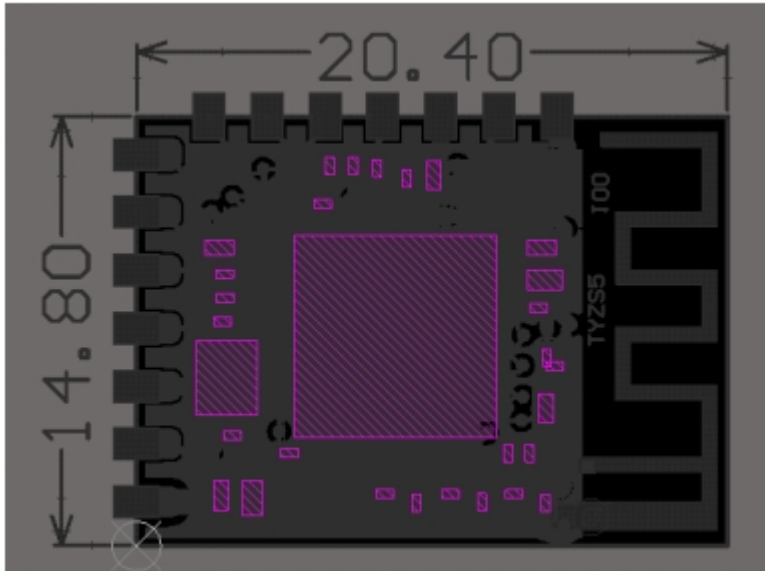


Figure1. TYZS5dimensional drawing

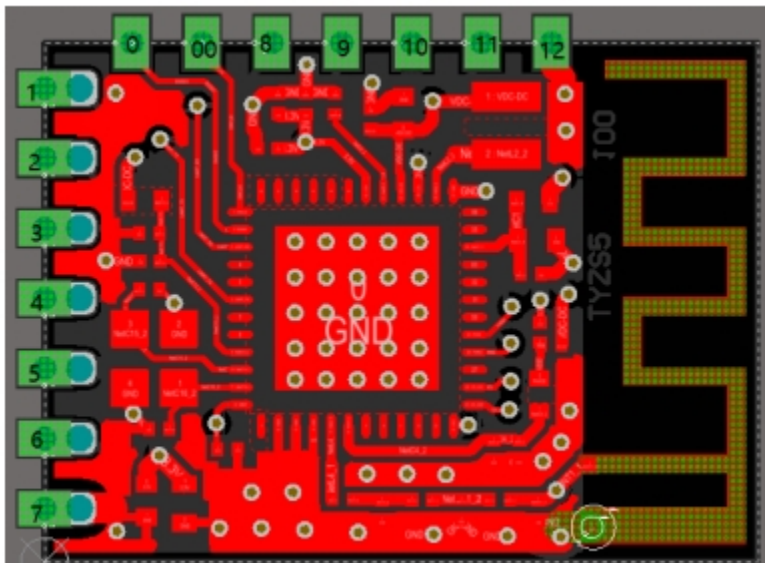


Figure2: Pin numbers

## 2.2 Pin definition

Interface pins are defined as shown in Table 1:

**Table 1, TYZS5 interface pins description**

Pin number	Symbol	IO type	Function
1	PWM1	I/O	Light driver port/GPIO pin usage.
2	PWM2	I/O	Light driver port/GPIO pin usage.
3	I2C_SDA	I/O	I2C_SDA, GPIO pin usage.
4	I2C_SCL	I/O	I2C_SCL, GPIO pin usage.
5	VCC	P	Module power supply pin (common supply voltage: 3.3V)
6	ADC	AI	ADC! [img](file:///C:/Users/hyper/AppData/Local/Temp/ksohtml/wpsC81C.tmp.png), 12-bit precision SAR analog to digital converter
7	GND	P	The reference ground of the module.
0	SWDIO	I/O	JLINK SWDIO programming pin. Can be used as a GPIO pin in normal applications.
00	SWCLK	I/O	JLINK SWCLK programming pin. Can be used as a GPIO pin in normal applications.
8	RXD	I/O	UART0_RXD, RX serial port.
9	nRST	I	Hardware reset pin, the chip is reset when the pin is LOW; Power-on reset of the module, the user can use this pin as needed.
10	VCC	P	Module power supply pin (common supply voltage: 3.3V); Since there's an internal connection to the 3.3V network, no external handling is necessary.
11	TXD	O	UART0_TXD, TX serial port.
12	GND	P	The reference ground of the module is internally connected to GND and does not need to be handled externally.

Description: P indicates the power pin; I/O indicates the input/output pin; AI indicates analog input pin.

nRST is only the module hardware reset pin; it cannot clear Zigbee net-pairing information.

(1): This pin can only be used as an ADC port. It cannot be used as a normal IO port. If it is not used, it needs to be left floating.

As an ADC input, the input voltage range is limited to 0-AVDD and can be configured by software.

## 2.3 Test point definition

Test pins are defined in Table 2:

**Table 2, TYZS5 test pins description**

Pin number	Symbol	IO type	Function
-	~	I	For module production testing

Description: This test pin is bottom PAD and is not recommended for use.

### 3. Electrical parameters

#### 3.1 Absolute electrical parameters

**Table 3, Absolute parameters**

Parameters	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-50	150	°C
VCC	Input voltage	-0.3	3.8	V
Electrostatic discharge voltage (human-body model)	TAMB-25°C	-	2.5	KV
Electrostatic discharge voltage (machine model)	TAMB-25°C	-	0.5	KV

#### 3.2 Operating conditions

**Table 4, Normal operating conditions**

Parameters	Description	Minimum value	Typical value	Maximum value	Unit
Ta	Operating temperature	-40	-	85	°C
VCC	Operating voltage	1.8	3.3	3.8	V
VIL	IO low input	-0.3	-	VCC*0.25	V
VIH	IO high input	VCC*0.75	-	VCC	V
VOL	IO low output	-	-	VCC*0.1	V
VoH	IO high output	VCC*0.8	-	VCC	V
Imax	IO drive current	-	-	12	mA

#### 3.3 Zigbee TX power consumption

**Table 5, Power consumption during continuous TX**

Symbol	Rate	Transmission power	Typical value	Unit
IRF	250Kbps	+11.66dBm	118	mA
IRF	250Kbps	+11.28dBm	32	mA
IRF	250Kbps	+11.02dBm	17	mA

Note: When testing the above data, continuous transmission duty cycle=100%.

### 3.4 The Zigbee RX power consumption

**Table 6, Power consumption during continuous RX**

Symbol	Rate	Typical value	Unit
IRF	250Kbps	8	mA

Note: When UART is active, the RX mode current is 14mA.

### 3.5 Power consumption when operating

**Table 7, TYZS5 operating current**

Operation mode	Operating condition, Ta=25°C	Average value	Maximum value	Unit
Quick configuration	Module in quick configuration state	10	40	mA
Network connection state	Connected to a network	-	-	mA
Deep sleep mode	Deep sleep mode and retains 64KB Flash	1.4	3	uA

## 4. RF Characteristics

### 4.1 Basic RF characteristics

**Table 8, Basic RF characteristics**

Parameter	Description
Operating frequency	2.405 to 2.480GHz
Physical layer standard	IEEE 802.15.4
Data transfer rate	250Kbps
Antenna type	PCB antenna
Line of sight	>100m

## 4.2 Zigbee Output performance

Table 9, Continuous TX performance

Parameter	Minimum value	Typical value	Maximum value	Unit
Maximum output	-	+11.66	-	dBm
Minimum output	-	+11.02	-	dBm
Output power adjustment step	-	-	-	dB
Frequency error	-15	-	+15	ppm
Output adjacent channel suppression		-31		dBc

## 4.3 Zigbee RX sensitivity

Table 10, RX Sensitivity

Parameter	Minimum value	Typical value	Maximum value	Unit
PER<10%, RX sensitivity, 250Kbps@OQPSK	-	-102	-	dBm

## 5. Antenna signal

### 5.1 Antenna type

Default PCB onboard antenna connection

### 5.2 Antenna interference reduction

To optimize Zigbee performance of the wireless module in combination with the PCB onboard antenna, it is recommended to keep the antenna at least 15mm from other metal parts.

The user PCB board should not be routed around the antenna area and should not be covered with copper to avoid affecting the antenna radiation performance. It is recommended that the adapter board antenna area be hollowed out.

For the module PCB onboard antenna area refer to Figure 3 “The TYZS5 mechanical dimensional drawing” below.

## 6. Packaging information and production guide

### 6.1 Mechanical dimensions

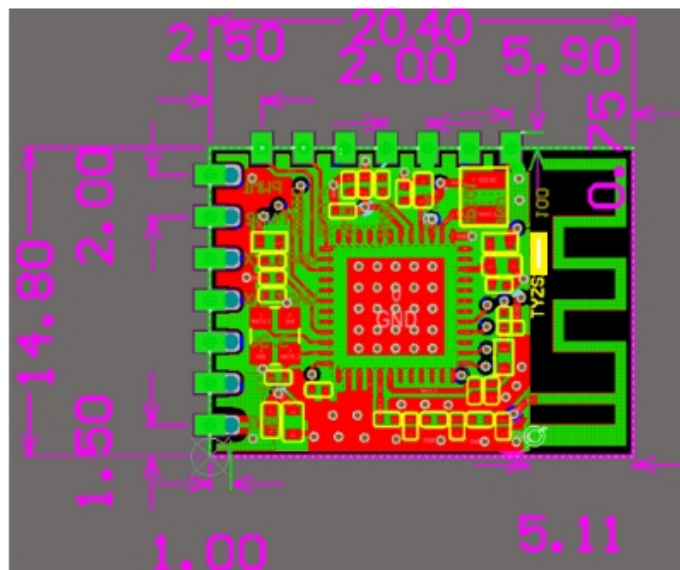


Figure3: The TYZS5mechanical dimensional drawing

**6.2 Production Guide**

The storage conditions for the module after it has been shipped are as follows:

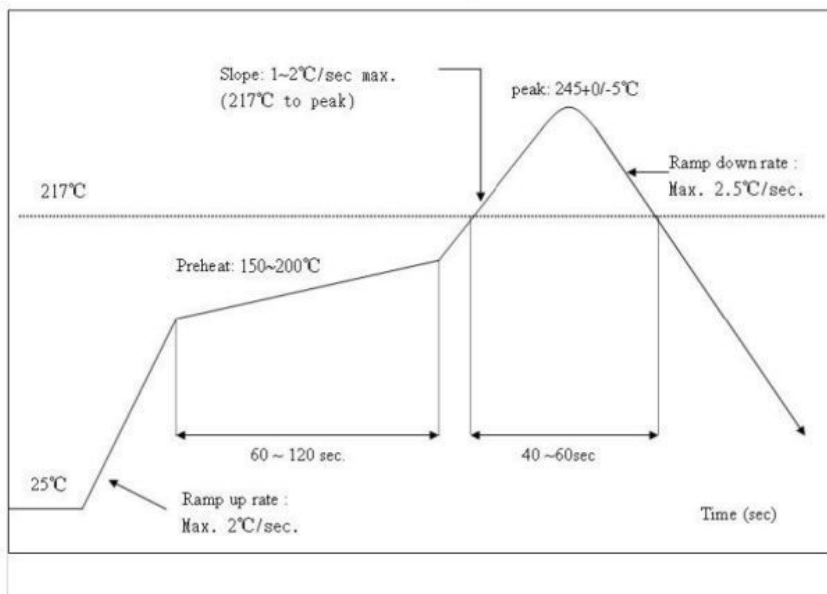
- 1.The moisture resistant bag must be stored at a temperature below 30°C, and under a relative humidity below 85%.
2. The shelf life of dry packed products is six months following the packaged date.

Important information

- 1.All line workers must wear anti-static wrist straps and anti-static clothing throughout the entire production process.
- 2.It is strictly prohibited to allow a module to come into contact with water or other contaminants during operations.

**6.3 Recommended furnace temperature curve**

Refer to IPC/JEDEC standard ; Peak Temperature : <250°C ; Number of Times: ≤2 times ;



**Regulatory Module Integration Instructions**

This device complies with part 15.247 of the FCC Rules.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The antenna is PCB Antenna and maximum gain is 2.0dBi .

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements.

The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, use this module only with the included onboard antenna.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

**FCC Statement**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

**FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

**FCC Label Instructions:**

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: 2ANDL-TYZS5 """,or "Contains FCC ID: 2ANDL-TYZS5", Any similar wording that expresses the same meaning may be used.